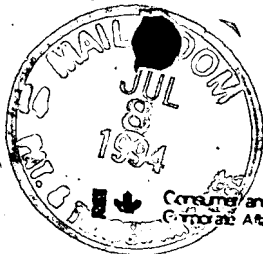


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(11) (A) No 1 165 785

(45) ISSUED 840417

(52) CLASS 268-28

(51) INT. CL. E05F 15/16<sup>3</sup>

(19) (CA) **CANADIAN PATENT** (12)

(54) FLAME PROOF OPERATOR AND CONTROL GEAR FOR  
COMMERCIAL AND INDUSTRIAL SLIDING DOOR

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(21) APPLICATION NO. 379,030

(22) FILED

810604

June 4/81

NO. OF CLAIMS 2

Canada

CONTINUED BY THE PATENT OFFICE OTTAWA  
C.A. 276 (11/82)

This invention relates to industrial door operators more specifically to a novel operator for the actuation of many types of upward acting or horizontally sliding doors or gates suitable for use in locations where the electrical system must be weatherproof or explosion proof. Throughout the specification and claims, the gates and doors are all referred to as doors.

10 Industrial and commercial door operators for garages and the like are well known and different types have been on the market for a number of years. There are several different types of door operators. Some of these require that all the electrical system be completely weatherproof or explosion proof for use in mines or factories wherein the environment contains gases or particles possibly of an explosive nature. In the past it has been very expensive to make a door operator mechanism completely explosion or weather proof because the contactors, limit switches and other switches have all had to be separately encased in explosion or weather proof containers and the explosion proof or weatherproof connectors have to be provided between  
20 these containers. Every piece of electrical equipment has to comply with explosion proof or weatherproof requirements laid down by government or other regulations. This results in a very expensive door operator mechanism.

We have now found that a novel industrial door operator can be made with a single weatherproof or explosion proof control box which contains all the electrical components within the single box and has special sealed entries either mechanical or electrical into this box and, therefore, avoids the necessity of having to provide explosion proof connectors between electrical components, and also allows the use of stand-  
30 ard electrical components, not ones that are explosion or weather proof.

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The present invention provides in a commercial and industrial door operator having an electric motor mounted on a frame, the motor driving a sprocket connected to

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an output shaft for operating the door, the improvement comprising a single weatherproof or explosion proof control box containing motor control contactors, limit switch, and a safety interlock switch adapted to disconnect power to the electric motor and allow manual operation of the door. In another embodiment, a brake is attached to the electric motor and the control box contains a solenoid to open the brake only when the motor is operating, the brake having a manual release to allow manual operation of the door.

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In drawings which illustrate embodiments of the invention,

Fig. 1 is an isometric view of an explosion proof door operator according to one embodiment of the present invention.

Fig. 2 is an elevational view showing the inside of the control box from the door operator of Fig. 1.

Fig. 3 is an elevational view of a weatherproof door operator according to another embodiment of the present invention.


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Referring to Figs. 1 and 2, the door operator 10 comprises an explosion proof motor 11 with a V-belt pulley 12 on the motor shaft driving V-belt pulley 13 on an intermediate shaft 14 by means of V-belt 15. A chain drive 16 from the intermediate shaft 14 has an intermediate sprocket 17 mounted on shaft 18 and a further chain drive 19 drives sprocket 20 on output shaft 21. The output shaft 21 opens and closes the door and is supported on two pillow blocks 22 mounted on frame members 23 extending for the length of the door operator 10.

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The control box 25 is mounted on the frame members 23 and is an explosion proof sealed container generally formed of cast aluminum, with a cover held to the box by a number of bolts

which fit into tapped holes in the box flange. An explosion  
 proof electrical conduit 26 leads from the box 25 to the  
 explosion proof motor 11. The motor shaft has a brake 27  
 mounted thereon operated by a lever mechanism 28 connected to  
 an arm 29 rotated by a shaft 30 entering the control box 25.  
 A manual release lever 31 on the other side of the door operator  
 from the brake has a linkage (not shown) to allow the brake to  
 be manually released when it is necessary to operate the door  
 operator manually. Adjacent the manual release lever 31 is a  
 chain sprocket 32 (as shown in Fig. 2) for a manual operated  
 chain 33. When this door is operated by the manual chain 33  
 the manual release lever 31 for the brake is activated and the  
 safety interlock switch <sup>43</sup> disconnects power to the motor so the  
 power cannot be turned on when an operator is manually opening  
 or closing the door.

A separate chain and sprocket system 35 from the  
 intermediate shaft 18 is connected to shaft 36 entering the  
 control box 25. The shaft 36 is supported in the control box  
 25 at the free end by a pillow block 37 and is threaded through-  
 out its length having two collars 38 positioned thereon. The  
 collars 38 have grooves which slide in a channel or ridge provided  
 on the base of the control box 25. Limit switches 39 are  
 provided to be triggered by the collars 38 moving backwards  
 and forwards on the threaded shaft 36, thus the limit switches  
 can be positioned to set the open and shut locations of the door.

The control system is operated from a 24-volt trans-  
 former 40 which in turn feeds a push button control station (not  
 shown) operating motor control relays 41 for operation of the  
 motor 11 in either direction. A solenoid 42 operates to rotate  
 brake shaft 30 so that when the motor is powered to go in either  
 direction the solenoid 42 is energized and the brake 27 is  
 released. A safety interlock switch 43 has a linkage (not shown)

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 to brake release arm 31 so that if the door operator is manually used, the safety interlock switch is moved to the "off" position and the motor cannot accidentally be switched on.

As may be seen in Figs. 1 and 2 the electrical components with the exception of the operating push button control and the motor itself, are retained within the control box 25. Thus the only wiring required in the field is from the control box 25 to the power supply and from the control box 25 to the push button control and the saving in explosion or weather proof type conduits is greatly reduced. Furthermore, the limit switch arrangement, solenoid, transformer, control relays and interlock switch are all standard open components and do not have to be individually encased in explosion proof containers.

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 Fig. 3 shows another embodiment of a door operator having a weatherproof control box 25 and weatherproof conduit 26 between motor and control box 25. The embodiment of the door operator shown in Fig. 3 is somewhat different to that shown in Fig. 1 but operates on substantially the same concept and the inside of the control box 25 is substantially the same as that shown in Fig. 2.

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 Whereas a brake is shown in all the drawings it will be apparent to those skilled in the art that brakes are not always required in door operators and may be omitted in which case the solenoid 42 is not required, however, an interlock switch <sup>43</sup> is still included within the control box 25 to disconnect the power to the electric motor when the operator is manually operated. Other embodiments include a manual overload relay which may be included within the control box 25, a friction clutch may be fitted on the shaft 15 to protect door and operator in case of obstruction, the clutch is adjustable to suit door size and weight.

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 Various changes may be made to the door operator

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mechanism disclosed herein, but in all cases a single weather-proof or explosion proof control box is provided. Different types and sizes of door operators may be used depending on the requirements of a particular weight and size of door. The scope of the invention is limited only by the claims.

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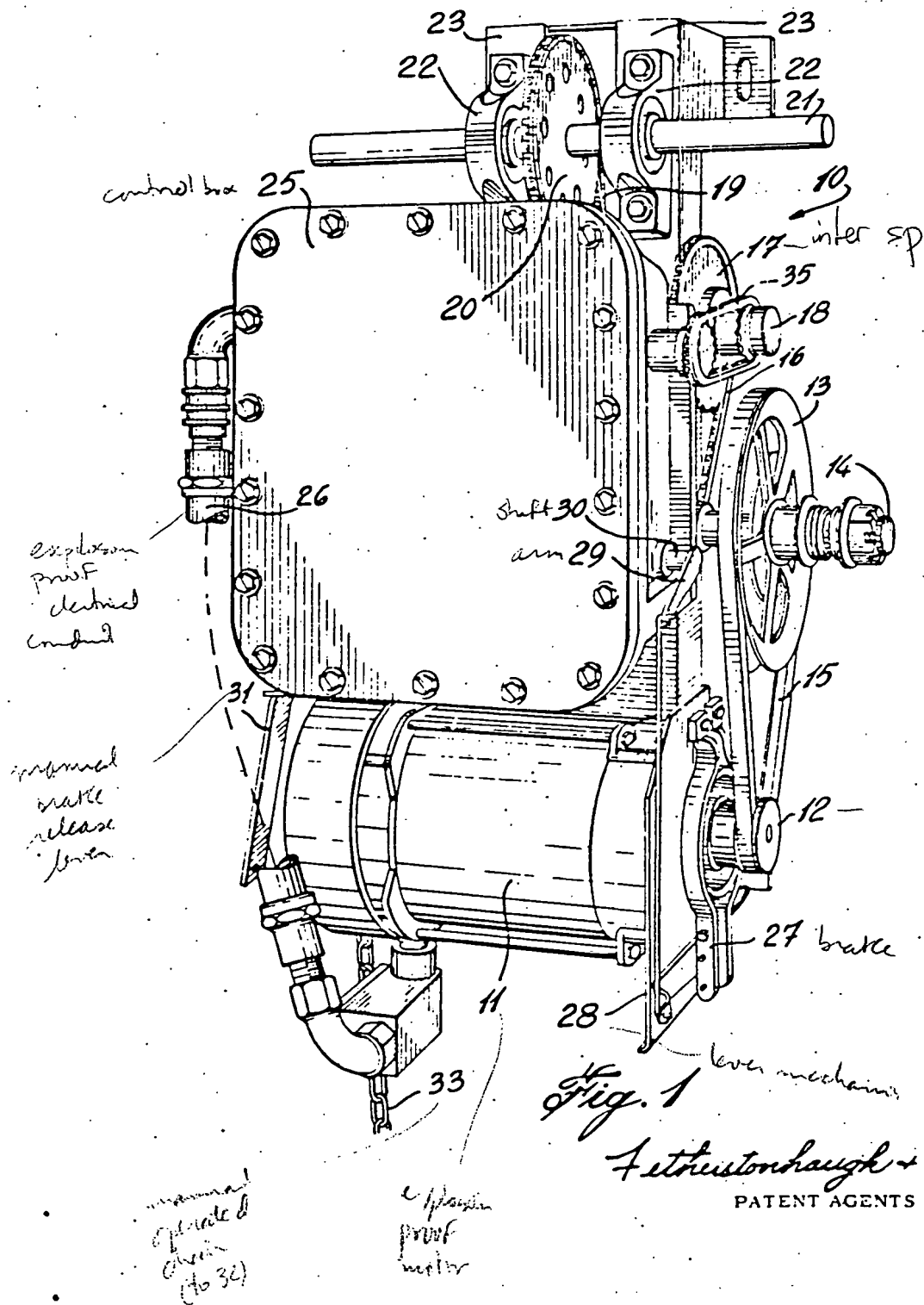
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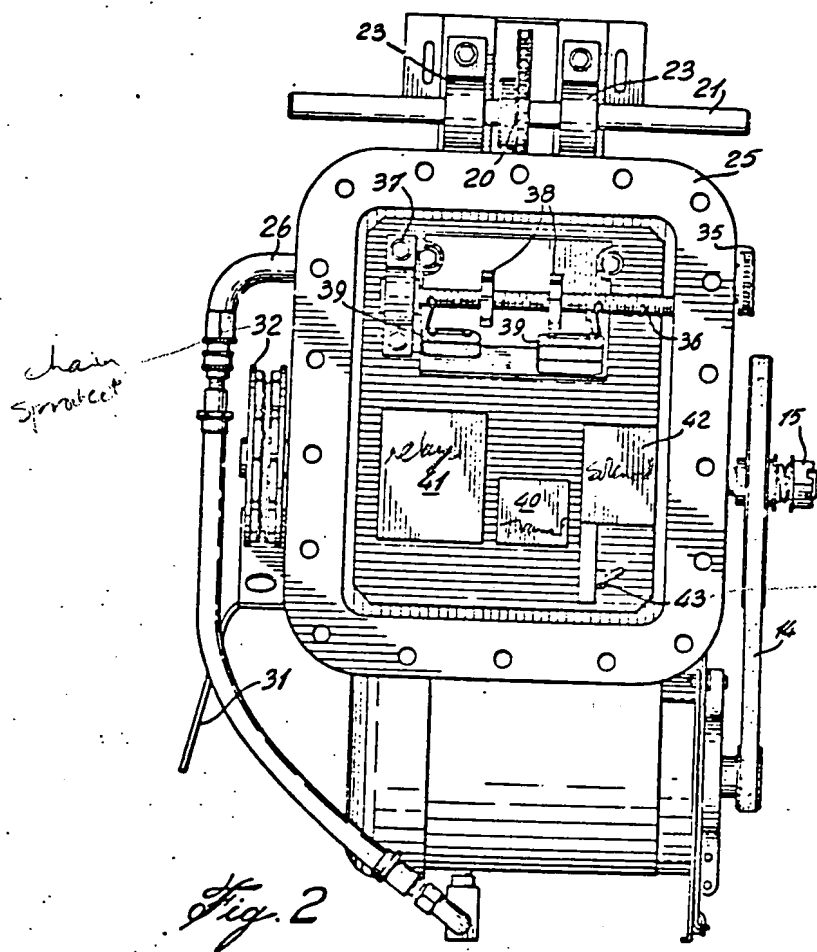
The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a commercial and industrial door operator having a weather proof or explosion proof electric motor mounted on a frame, the motor driving a sprocket connected to an output shaft for operating the door, the improvement comprising: a single weather proof or explosion proof control box containing motor control contactors, limit switch, and a safety interlock switch adapted to disconnect power to the electric motor and allow manual operation of the door.

2. The door operator according to claim 1 including a brake attached to the electric motor and wherein the control box contains a solenoid to open the brake only when the motor is operating, the brake having a manual release to allow manual operation of the door.







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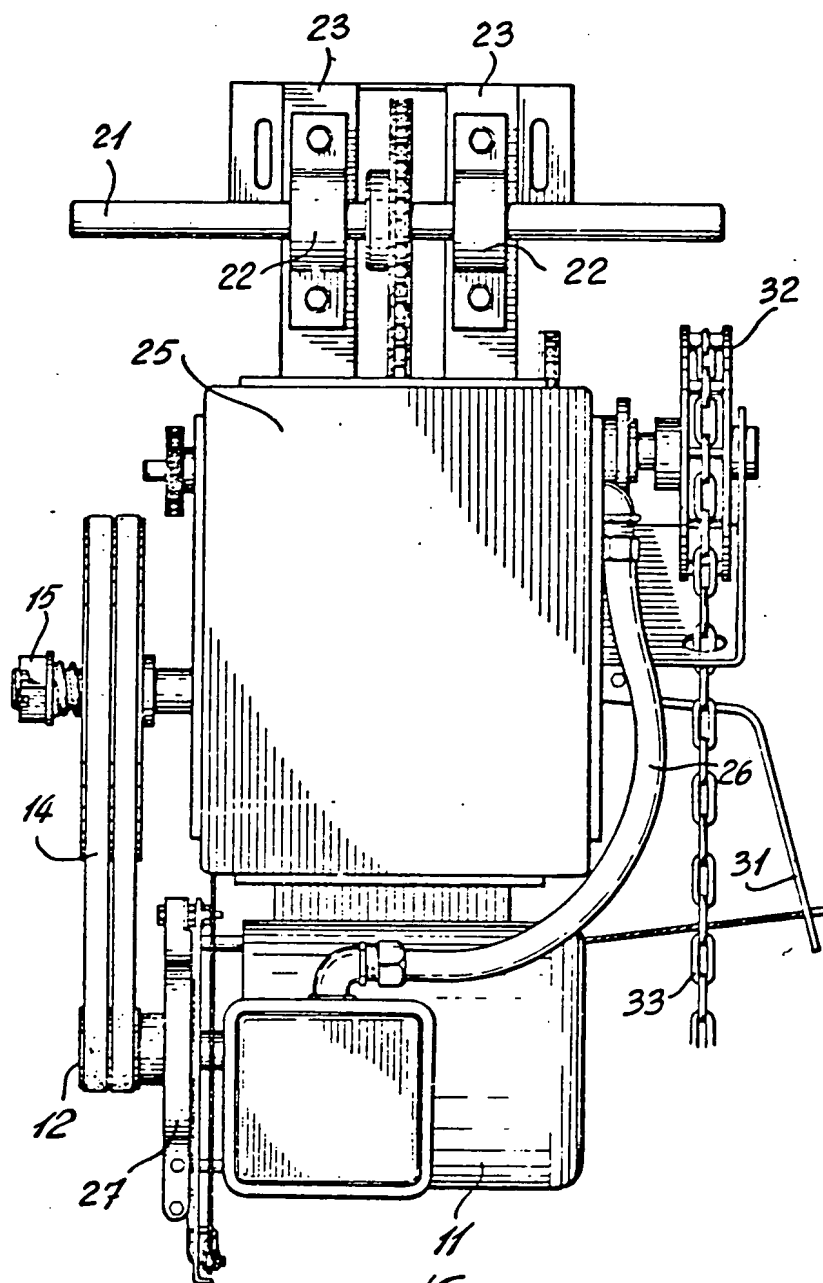


Fig. 3

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